PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-166580
(43)Date of publication of application : 25.06.1996

(51)Int.CI. G02F 1/1333
B32B 27/00

(21)Application number : 06-333514
(22)Date of filing : 14.12.1994

(71)Applicant : KANEGAFUCHI CHEM IND CO LTD
(72)Inventor : TAKASE JUNJI
FUJII SADAO

(54) HEAT-RESISTANT OPTICAL PLASTIC LAMINATED SHEET AND ITS PRODUCTION

(57)Abstract:
PURPOSE: To obtain an optical plastic sheet having rigidity, optical characteristics and heat resistance in combination by laminating a layer which gives high heat resistance and a layer which gives physical properties at room temp.
CONSTITUTION: A first layer comprising a material having heat resistance and high glass transition temp. and a second layer comprising a material having low glass transition temp. are laminated. The first layer is laminated on one or both surfaces of the second layer having lower glass transition temp. than the first layer so as to prevent thermal deformation of the second layer at high temp. The thickness of the first layer is determined depending on the thickness of the laminated sheet or desired heat resistance and stability, and generally, it is 20-80% of the thickness of the laminated sheet. When the obtd. laminated sheet is simply used as a substrate for a liquid crystal display device, it is required that the sheet has low retardation, and generally, the thickness of the sheet is preferably ≤50nm.

CLAIMS

[Claim(s)]

[Claim 1] The optical plastics laminating sheet excellent in the thermal resistance which comes to carry out the laminating of 1st at least one layer which consists of mixture of polycarbonate system resin and polyarylate system resin, and which is transparence optically, and the 2nd layer with a glass transition temperature lower than this layer which consists of a transparent ingredient optically, and transparency.

[Claim 2] The optical plastics laminating sheet according to claim 1 which comes to arrange the 1st layer to both sides of the 2nd layer.

[Claim 3] The optical plastics laminating sheet according to claim 1 or 2 whose retardation is 50nm or less.

[Claim 4] The optical plastics laminating sheet according to claim 1 to 3 with which 1st at least one layer consists of ingredients of the form birefringence which has retardation 100nm or more.

[Claim 5] The optical plastics laminating sheet according to claim 1 to 4 with which it comes to carry out the direct laminating of the 1st layer and the 2nd layer.

[Claim 6] The optical plastics laminating sheet according to claim 1 to 5 with which the 2nd layer consists of a polycarbonate.

[Claim 7] The optical plastics laminating sheet according to claim 1 to 6 which has a transparence conductive layer on a front face.

[Claim 8] The manufacture approach of the optical plastics laminating sheet excellent in thermal resistance and transparency optically characterized by the thing with a glass transition temperature lower than the film which consists of mixture of the polycarbonate system resin and polyarylate system resin which constitute the 1st layer, and the 1st layer which constitutes the 2nd layer to do for the direct heating laminating of the transparent film.

[Claim 9] The manufacture approach according to claim 8 that the film of the 1st layer which carries out a laminating is a film obtained by the solvent casting method.

[Claim 10] The heat-resistant transparence substrate for optoelectronics components using an optical plastics laminating sheet according to claim 1 to 7.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention is optically transparent and relates to the heat-resistant transparence substrate which used this laminating sheet for the optical plastics laminating sheet which has thermal resistance and its manufacture approach, and a list.
[0002]
[Description of the Prior Art] The optoelectronics component represented by the liquid crystal display component attracts attention with the rapid advance of an electronics technique, and various applications are presented by forming a component on the glass substrate which has a transparence conductive layer. When it included in a pocket mold device especially, the weight of a device became large for the big specific gravity of glass, therefore it pointed to thinning of a glass substrate and the substrate which is about 0.4mm became available. However, a technical problem is in the mechanical strength of glass, especially brittleness, and use of the substrate which carried out special processing of tempered glass etc. in order to reduce the endurance of a component, and in order to protect a component from an impact, a cure, such as using the sheet plastic for a metal frame or surface protections, is implemented. However, it has a technical problem called the yield fall by the crack in the inside of the manufacture process of this component.
[0003] As mentioned above, a substrate which is light and cannot break easily is desired strongly, the expectation for the display device using lightweight nature and a shock-proof point to a plastic plate is great, and some attempts to the plastic plate which has the thickness of about 0.4mm are tried.
[0004] Although the solvent casting method is learned, in order to give rigidity, when thick-film-izing a film, it is easy to produce defects, such as foaming, as a typical approach thermal resistance obtains the good high and charge of a plastics radical plate of surface smooth nature, and also since productivity falls sharply, industrial operation is difficult and about 200 micrometers is a limitation. Moreover, when it thick-film-izes with a melting extrusion method, the optical isotropy is spoiled, and also the surface smooth nature and the appearance by the die line at the time of shaping are bad, and it is difficult to use as a substrate for liquid crystal displays.
[0005] Therefore, although fabricating the hardening mold plastics like plastics like polymethylmethacrylate or a denaturation olefin which is essentially a low birefringence ingredient, a bridge formation acrylic which is seen by JP,6-194501,A, or epoxy in the shape of a sheet, and using it is examined, the former does not have the thermal resistance needed in a glass process, and the latter has technical problems, like productivity lacks in mass-production practicality bad. Moreover, although it is also possible to carry out the laminating of said heat-resistant optical film, and to sheet-ize it, that there are no adhesives excellent in thermal resistance and dependability, and when carrying out a heating laminating, high processing temperature is needed and degradation which a property does not have, such as denaturation, coloring, etc. of resin, takes place. Therefore, the ingredient available on the industrial target which has the rigidity and thermal resistance which can maintain a glass process and compatibility, and is excellent in shock resistance, and satisfies optical properties, such as transparence and low retardation, is not yet found out.
[0006]
[Problem(s) to be Solved by the Invention] This invention is optically transparent and the heat-resistant transparence substrate which used this laminating sheet for the optical plastics laminating sheet which has thermal resistance and its manufacture approach, and a list is offered.
[0007]
[Means for Solving the Problem] this invention persons resulted that the optical sheet plastic having rigidity, an optical property, and thermal resistance was obtained in header this invention by making it the laminated structure of the layer which takes charge of high thermal resistance, and the layer which takes charge of the physical property in a room temperature, as a result of repeating examination wholeheartedly that said purpose should be attained.

[0008] Namely, 1st at least one layer which the 1st of this invention becomes from the mixture of polycarbonate system resin and polyarylate system resin and which is transparence optically, The optical plastics laminating sheet excellent in the thermal resistance which comes to carry out the laminating of the 2nd layer with a glass transition temperature lower than this layer which consists of a transparent ingredient optically, and transparency the 2nd of this invention A film transparent on the optical target which consists of mixture of the polycarbonate system resin and polyarylate system resin which constitute the 1st layer, A transparent film on an optical target with a glass transition temperature lower than the 1st layer which constitutes the 2nd layer The heat-resistant transparence substrate for optoelectronics components with which the above-mentioned optical plastics laminating sheet was used for the 3rd of this invention for the manufacture approach of an optical plastics laminating sheet excellent in thermal resistance and transparency characterized by carrying out a direct heating laminating is made into the contents, respectively.

[0009] This invention is a sheet which has the laminated structure which consists of the 1st layer which consists of a heat-resistant high ingredient which has high glass transition temperature, and the 2nd layer which consists of an ingredient which has low glass transition temperature. The bisphenol A mold polycarbonate of a polycarbonate which can be used industrially is usually desirable from the ease and cost of acquisition among the ingredients which constitute the 1st layer. In order to keep Tg of mixture high, high Tg is needed for the polyarylate mixed. if such polyarylate is illustrated — as a bisphenol component — 1 and 1-screw (4-hydroxyphenyl) - 3, 3, 5-trimethyl cyclohexane, 4, and 4'-(alpha-methyl benzylidene) bisphenol, 9, and 9-screw (4-hydroxyphenyl) fluorene etc. is mentioned, and these are independent — or two or more sorts are combined and it is used. as a phthalic-acid component, a terephthalic acid and isophthalic acid are desirable, and these are independent — or two or more sorts are combined and it is used. As for the ratio in the case of using combining a terephthalic acid and isophthalic acid, 10:90-90:10 are desirable. When this range is crossed, crystallinity becomes large and there is an inclination which has a bad influence on transparency etc. Moreover, Tg becomes high, so that the ratio of a terephthalic acid is high. As a polymerization reaction, solution reactions, such as melting polymerizations, such as an ester interchange, and interfacial polycondensation, can be chosen. Although the mixture of polycarbonate system resin and polyarylate system resin may be mixed by what kind of ratio if it constitutes a transparent film optically and maintains high Tg, it is good to obtain the small film of a birefringence to include a polycarbonate 40 to 90% of the weight preferably ten to 90% of the weight from a cost side.

[0010] It was laminated by one side of the 2nd layer or both sides which have low glass transition temperature rather than this layer, and the 1st layer has played the role which prevents the heat deformation at the time of the heating at high temperature of the 2nd layer. Although the thickness of the 1st layer is determined by the thickness and the heat-resistant configuration stability demanded of a laminating sheet, it is usually 20 - 80% of a laminating sheet. When only using this laminating sheet as a substrate for liquid crystal displays, although a sheet needs to be low retardation and it is based also on the class of liquid crystal display, generally, 50nm or less is desirable and is 20nm or less more preferably. Moreover, when giving the function of phase contrast to this sheet, after giving specific retardation beforehand to at least one layer which carries out a laminating, it can obtain easily by carrying out a laminating. Generally, 100nm or more of things for which retardation 300nm or more is given preferably is demanded. It is convenient for the thermal stability of the phase contrast sheet with which giving the specific retardation which has high thermal resistance especially to the 1st layer was acquired.

[0011] In order to give specific retardation to the 1st layer, it can obtain by carrying out orientation of the above-mentioned polymeric materials. It can obtain by generally extending a high polymer film with little anisotropy to one shaft or biaxial optically. Although these films can be obtained with a well-known film-ized technique, the film by the solvent casting method is most preferably used from front-face nature and an optical property.

[0012] Retardation is determined by orientation extent of the thickness of a film, and a molecule, and the orientation of a molecule is greatly influenced by extension conditions. Therefore, in order to control

retardation to a precision, it is desirable to make thickness of the 1st layer comparatively thin and to take the large control width of face of extension conditions. Therefore, the thickness of the 1st layer is 40-100 micrometers desirably [being chosen from 20-150 micrometers], and more preferably. Moreover, the special ingredient which adjusted the refractive index of the direction of thickness so that it might differ from any refractive index of field inboard can also be suitably used so that JP,2-160204,A and JP,3-85519,A may see. Also in this case, the 1st layer may be a double layer not only a monolayer but more than two-layer.

[0013] As an ingredient which constitutes the 2nd layer, generally it has low form birefringence, thick-film-ization consists of easy ingredients, and thermal resistance uses a thing lower than the 1st layer. When the 2nd layer is heated in a laminating process by a heating welding method etc. more than glass transition temperature, it is also possible to use the ingredient which does not have low form birefringence, and the optical initial property required of the 2nd layer is eased sharply. Although it is dependent on heat-resistant extent demanded, it is 140 degrees C or more preferably, as for the glass transition temperature of the ingredient which constitutes the 2nd layer, it is desirable that it is lower than the glass transition temperature of the ingredient which constitutes the 1st layer 20 degrees C or more, and a thing low 40 more degrees C or more is [that what is necessary is generally just 100 degrees C or more] much more desirable [glass transition temperature]. The thermal resistance of the laminating sheet plastic of this invention has the large contribution from the thermal resistance of the 1st layer. The 2nd layer consists of two or more layers more than a monolayer or two-layer.

[0014] The ingredient excellent in compatibility with the 1st layer of the ingredient which constitutes the 2nd layer is desirable, and it needs to choose the optimal plastic material. The 2nd layer has played the role for taking out the rigidity of the sheet in ordinary temperature. Moreover, since it is protected by the 1st layer to thermal deformation, the 1st-layer protection which has the high glass transition temperature which exists in the one side or both sides at the time of the heating at high temperature more than glass transition temperature is received, and a gestalt is held, without flowing also to stress, such as pressurization. Although the thickness of the 2nd layer is determined like the case of the 1st bed depth by the property required of a laminating sheet, 80 - 20% of the thickness of the whole laminating sheet is chosen.

[0015] Although the plastics laminating sheet of this invention can fabricate the plastics which constitutes each class by the melting co-extruding method, it can obtain a high-definition plastics laminating sheet easily by laminating, after film-izing each class in the thickness independently needed with the solvent casting method or a melting extrusion method. Although laminating using adhesives is also possible, it is necessary to choose adhesives so that the thermal resistance of a laminating sheet may not be spoiled. The property at the time of an elevated temperature to a heating lamination is desirable. In this case, it is necessary to perform ingredient selection in consideration of the compatibility of the 1st layer and the 2nd layer.

[0016] as a suitable ingredient of the 2nd layer, the polyester and polyarylate which have low glass transition temperature comparatively, or a polycarbonate is mentioned, and these are independent -- or two or more sorts are combined and it is used. The bisphenol A mold polycarbonate has the 1st layer and high compatibility, and is desirable especially as the 2nd layer ingredient from the point of a property and cost while it is widely used as engineering plastics and glass transition temperature has about 150 degrees C and a moderate value.

[0017] Since the heat-resistant optical plastics laminating sheet of this invention comes to carry out the laminating of the 1st layer and the 2nd layer like the above, it has the description that a heat-resistant thick-film sheet can be obtained by low cost, taking advantage of the advantage of the solvent casting method for being easy to obtain the thin film excellent in the optical property. Moreover, when obtaining a laminating sheet by the laminating method, a high heatproof layer (the 1st layer) can use the film which formed membranes by the solvent casting method from the point of an optical property or surface smooth nature. furthermore, the ingredient which has low glass transition temperature comparatively -- a melting extrusion method -- a film with a good optical property -- productivity -- the description that obtaining highly is easy is used and the 2nd layer can also reduce the cost of a

laminating sheet using a melting extruded film
[0018] Moreover, according to the heating laminating method, the laminating sheet which the fall improvement of the birefringence which will generally receive the effectiveness of heat annealing since the 2nd layer is heated more than glass transition temperature at the time of a lamination, and it had with the single film was carried out by heat annealing, consequently was obtained has the description of becoming smaller than total of the retardation of a single film. One of the suitable approaches of a heating lamination is the heating / pressurization laminating method by the heating roller or the belt. Although whenever [stoving temperature / to need] changes with ingredients to laminate, it is higher than the glass transition temperature of the ingredient which constitutes the 2nd layer, and temperature lower than the glass transition temperature of the ingredient which constitutes the 1st layer is suitable. As for dividing heating into two or more phases, and carrying it out, it is also possible to heat it to lamination temperature and it to carry out actual sticking by pressure, after carrying out preparative pressure arrival of the heat lamination at low temperature comparatively etc. Since the cellular contamination at the time of a heat lamination is prevented, a vacuum lamination method is also suitably usable. In order that the plastics laminating sheet of this invention of the structure like the above may maintain the common use with the glass in a process or compatibility, such as rigidity, 0.2-1mm is suitable for thickness, and especially its 0.3-0.7mm is desirable. About an optical property, 80% or more of total light transmission is desirable.
[0019] Like glass, as a substrate for optoelectronics components, although the plastics laminating sheet of this invention can carry out secondary elaboration, such as transparence electric conduction processing, it needs to find out the optimal conditions as processing conditions, referring to the conditions currently carried out with the transparence electric conduction film. Moreover, the barrier engine performance [as opposed to / unlike a glass substrate / oxygen a steam, etc.] performs organic system gas barrier processing of an ethylene-vinylalcohol copolymer, a polyvinylidene chloride, etc., and inorganic system gas barrier processing which consists of silica alumina etc. if needed in order to fall.
[0020] It is also possible to give a function beforehand to 1st at least one layer on the other hand, as described above. For example, after extending beforehand the film which constitutes the 1st layer, giving fixed form birefringence and considering as a phase contrast film, the plastics laminating sheet which made the phase contrast film unify can be obtained by forming a laminating sheet. In this case, since the phase contrast film which constitutes the 1st layer has a high glass transition temperature, also in a heating lamination, it has the description that retardation seldom falls and can obtain the sheet by which retardation was controlled highly.
[0021] When the 1st layer which consists of a phase contrast film is prepared in both sides of the 2nd layer and the optical axis of the phase contrast film of the 1st layer is maintained mutually in parallel, the phase contrast of the obtained sheet serves as each total. Thus, when the 1st layer has been arranged, the deformation of the curvature of the sheet obtained by the 1st one layer as compared with the case where phase contrast is made to discover etc. which is not desirable can be prevented. Moreover, each phase contrast film which constitutes the 1st layer is the purpose of the improvement in a property, such as raising the contrast of the obtained liquid crystal display, and it is also desirable to make the optical axis cross moderately and to arrange it. Usually, by taking such a configuration, although the phase contrast film of two or more sheets is needed as a STN liquid crystal display in addition to a substrate, since the substrate ingredient has the function of two or more phase contrast films, it has the advantage that the configuration of a liquid crystal display can be simplified. The include angle of the relative optical axis which the 1st two layer makes is variously decided in connection with many parameters which design a liquid crystal display. According to this laminating sheet, what has whenever [angular relation / to need] can be obtained easily. moreover, this laminating sheet -- the -- it does not restrict preparing further layers 1 and other than the 2nd layer. The 1st two layer of the retardation value may be the same, or may differ. Furthermore, as long as it is required, the class of ingredient which constitutes these 1st layer may be changed.
[0022] Moreover, a transparent conductive plastics laminating sheet can be obtained by using for a front face the film which has a transparence conductive layer as the 1st layer. Furthermore, phase contrast

and a transparence electric conduction one apparatus plastics laminating sheet can also be obtained by using the film which has a phase contrast film on the one 1st layer film, and has transparent conductivity on another 1st layer film.

[0023] Glass, common use, or transposition is possible for the plastics laminating sheet of this invention from the point of thermal resistance and an optical property, and it is useful as a substrate being large and for optoelectronics components. Furthermore, it is useful especially as a substrate ingredient for liquid crystal display components with which unlike glass it excels in shock resistance, and large area-ization is demanded since it is lightweight.

[0024]

[Example] Hereafter, although this invention is concretely explained based on an example, this invention is not limited to these.

[0025] an example 1 — as an ingredient of the 1st layer with 50 % of the weight of the bisphenol A mold polycarbonates 1 and 1-screw (4-hydroxyphenyl) - The film was produced by the solvent casting method which consists of mixture of 50 % of the weight of polyarylates (Tg280 degree C) which consists of a 3, 3, and 5-trimethyl cyclohexane / a terephthalic acid / isophthalic acid (mole-ratio 2/1/1). The film of the A4 version size of 75-micrometer thickness whose glass transition temperature is 215 degrees C and whose retardation is 8nm is used. As an ingredient of the 2nd layer The film was produced by the solvent casting method, and using the bisphenol A mold polycarbonate film of 120-micrometer thickness whose glass transition temperature is 150 degrees C and whose retardation is 13nm, the 2nd layer was inserted by two per layer [the], and temporary sticking by pressure was carried out at 145 degrees C with the vacuum lamination machine. Then, it inserted with the glass plate and the 270-micrometer laminating sheet which carried out heating and actual sticking by pressure and which was firmly welded to 185 degrees C was obtained. The softening temperature by TMA analysis of the obtained laminating sheet is 245 degrees C, and showed softening temperature almost comparable as a film independent the 1st layer. On the other hand, the softening temperature of a polycarbonate was 180 degrees C. Moreover, even if it pressurized the created laminating sheet at 200 degrees C at 20kg/cm2, the gestalt was held and retardation had 17nm, and the outstanding thermal resistance and the outstanding optical isotropy. Moreover, surface roughness was 0.030 micrometers on the average.

[0026] an example 2 — as an ingredient of the 1st layer By the solvent casting method which consists of mixture of 50 % of the weight of polyarylates (Tg240 degree C) which consists of 50 % of the weight of bisphenol A mold polycarbonates, and a 4 and 4'-(alpha-methyl benzylidene) bisphenol / terephthalic acid / isophthalic acid (mole ratio 2:1:1) The film of the A4 version size of 75-micrometer thickness whose produced glass transition temperature is 195 degrees C and whose retardation is 11nm is used. As an ingredient of the 2nd layer The film was produced by the solvent casting method, and using the bisphenol A mold polycarbonate film of 120-micrometer thickness whose glass transition temperature is 150 degrees C and whose retardation is 13nm, the 2nd layer was inserted by two per layer [the], and temporary sticking by pressure was carried out at 145 degrees C with the vacuum lamination machine. Then, it inserted with the glass plate and the 270-micrometer laminating sheet which carried out heating and actual sticking by pressure and which was firmly welded to 180 degrees C was obtained. The softening temperature by TMA analysis of the obtained laminating sheet is 225 degrees C, and showed softening temperature almost comparable as a film independent the 1st layer. On the other hand, the softening temperature of a polycarbonate was 180 degrees C. Moreover, even if it pressurized the created laminating sheet at 185 degrees C at 20kg/cm2, the gestalt was held and retardation had 19nm, and the outstanding thermal resistance and the outstanding optical isotropy. Moreover, surface roughness was 0.025 micrometers on the average.

[0027] an example 3 — as an ingredient of the 1st layer By the solvent casting method which consists of mixture of 40 % of the weight of polyarylates (Tg310 degree C) which consists of 60 % of the weight of bisphenol A mold polycarbonates, and 9 and 9-screw (4-hydroxyphenyl) fluorene / terephthalic acid / isophthalic acid (mole ratio 2:1:1) The film of the A4 version size of 75-micrometer thickness whose produced glass transition temperature is 214 degrees C and whose retardation is 10nm is used. As an ingredient of the 2nd layer The film was produced by the solvent casting method, and using the

bisphenol A mold polycarbonate film of 120-micrometer thickness whose glass transition temperature is 150 degrees C and whose retardation is 13nm, the 2nd layer was inserted by two per layer [the], and temporary sticking by pressure was carried out at 145 degrees C with the vacuum lamination machine. Then, it inserted with the glass plate and the 270-micrometer laminating sheet which carried out heating and actual sticking by pressure and which was firmly welded to 185 degrees C was obtained. The softening temperature by TMA analysis of the obtained laminating sheet is 240 degrees C, and showed softening temperature almost comparable as a film independent the 1st layer. On the other hand, the softening temperature of a polycarbonate was 180 degrees C. Moreover, even if it pressurized the created laminating sheet at 180 degrees C at 20kg/cm2, the gestalt was held and retardation had 19nm, and the outstanding thermal resistance and the outstanding optical isotropy. Moreover, surface roughness was 0.025 micrometers on the average.

[0028] The phase contrast film with which vertical uniaxial stretching is performed for the blend film of the 1st layer used in the example 4 example 1 by free Masakazu shaft extension, and retardation has 390nm was obtained. It used as this phase contrast film and the 1st layer of a blend film of the 1st layer of the example 1 which has 75 micrometers in non-extended thickness, heating welding was performed like the example 1 using the polycarbonate film of 200-micrometer thickness which has the 20nm retardation fabricated by the melting extrusion method as an ingredient of the 2nd layer, and the laminating sheet of 340-micrometer thickness with which the phase contrast film was united was obtained. The obtained laminating sheet had 380nm retardation. Moreover, the retardation distribution within a field had 7nm and good homogeneity.

[0029] The blend film used as the 1st layer ingredient in example 5 example 1, And the gas barrier layer which becomes one front face of this blend film from SiOx, 75 micrometers in thickness and the transparence electric conduction film which has 60ohms of surface electrical resistance and ** which prepared the transparence conductive layer which consists of ITO one by one are used as an ingredient of the 1st layer. As an ingredient of the 2nd layer The polycarbonate film of 200-micrometer thickness which has the 20nm retardation fabricated by the melting extrusion method is used. The polycarbonate film was inserted with the two above-mentioned kinds of polyarylate films, heating welding was performed like the example 1, and the laminating sheet which has a transparence conductive layer on a front face was obtained. Thickness was 350 micrometers and the surface electrical resistance of the obtained laminating sheet was 45ohm/**.

[0030] The laminating sheet which performs heating welding like an example 1, has a transparence conductive layer on a front face using the polycarbonate film of 200-micrometer thickness which has the 20nm retardation fabricated by the melting extrusion method as an ingredient of the 2nd layer, using the phase contrast film of example 6 example 4 publication and the transparence electric conduction film of example 5 publication as the 1st layer, respectively, and moreover has phase contrast was obtained. The obtained laminating sheet had the surface electrical resistance of the phase contrast which thickness is 345 micrometers and is 385nm, and 45ohms / **.

[0031] Using the laminating sheet obtained in the example 7 example 1, by the vacuum sputtering method, sequential formation of 500A and the 1000A of the ITO layers was carried out for the SiOx layer, and the heat-resistant transparence substrate which has a barrier layer and a transparence conductive layer was created. For surface electrical resistance, 52ohm/**, and oxygen permeability are [the obtained heat-resistant transparence substrate] 1.2 cc/m2/day. It was the following.

[0032]

[Effect of the Invention] While having shock resistance and rigidity by this invention as above-stated, the heat-resistant transparence plastics laminating sheet excellent in the optical property is offered. This plastics laminating sheet is useful as an optical substrate which replaces the glass in the optoelectronics field, especially the liquid crystal display field.